CLAIMS:

1.A method of depositing a metal layer on a substrate, the method comprising:

a) providing a substrate in a process chamber;

b) exposing the substrate to a metal-carbonyl precursor gas;

c) forming a metal layer on the substrate from thermal decomposition of the metal-carbonyl precursor gas;

d) exposing the metal layer to a reducing gas; and

e) repeating said exposing of said substrate, said forming and said exposing of said metal layer until a metal layer with a desired thickness is formed.

2. The method according to claim 1, wherein the metal-carbonyl precursor comprises at least one of $W(CO)_6$, $Ni(CO)_4$, $Mo(CO)_6$, $Co_2(CO)_8$, $Rh_4(CO)_{12}$, $Re_2(CO)_{10}$, $Cr(CO)_6$, and $Ru_3(CO)_{12}$.

3. The method according to claim 1, wherein the metal layer comprises at least one of W, Ni, Mo, Co, Rh, Re, Cr, and Ru.

4. The method according to claim 1, wherein a flow rate of the metal-carbonyl precursor is less than about 4 sccm.

5. The method according to claim 1, wherein the metal-carbonyl precursor gas further comprises at least one of a dilution gas and a carrier gas.

6. The method according to claim 5, wherein the at least one of a dilution gas and a carrier gas comprises an inert gas.

7. The method according to claim 6, wherein the inert gas comprises at least one of Ar, He, Kr, Xe, and N_2.

8. The method according to claim 5, wherein the precursor gas includes a carrier gas having a flow rate between about 50 sccm and about 500 sccm.

9. The method according to claim 8, wherein a flow rate of the carrier gas is between about 50 sccm and about 200 sccm.

10. The method according to claim 5, wherein a the precursor gas includes a dilution gas having a flow rate between about 50 sccm and about 1000 sccm.

11. The method according to claim 10, wherein a flow rate of the dilution gas is between about 50 sccm and about 500 sccm.

12. The method according to claim 1, wherein the metal-carbonyl precursor flow is between about 1 sec and about 500 sec.

13. The method according to claim 1, wherein the reducing gas comprises at least one of a silicon-containing gas, a boron-containing gas, and a nitrogen-containing gas.

14. The method according to claim 13, wherein reducing gas comprises at least one of SiH_4, Si_2H_6, and $SiCl_2H_2$.

15. The method according to claim 13, wherein the reducing gas comprises at least one of BH_3, B_2H_6, and B_3H_9.

16. The method according to claim 13, wherein the reducing gas comprises NH_3.

17. The method according to claim 1, wherein a flow rate of the reducing gas is less than about 500 sccm.

18. The method according to claim 1, wherein the reducing gas flow is between about 1 sec and about 120 sec.

19. The method according to claim 1, wherein the reducing gas further comprises a dilution gas.

20. The method according to claim 19, wherein the dilution gas comprises an inert gas.

21. The method according to claim 20, wherein the inert gas comprises at least one of Ar, He, Kr, Xe, and N_2.

22. The method according to claim 19, wherein a flow rate of the dilution gas is between about 50 sccm and about 2000 sccm.

23. The method according to claim 22, wherein a flow rate of the dilution gas is between about 100 sccm and about 1000 sccm.

24. The method according to claim 1, wherein the metal-carbonyl precursor gas and the reducing gas are sequentially flowed into the process chamber.

25. The method according to claim 1, further comprising flowing a purge gas in the process chamber.

26. The method according to claim 25, wherein the purge gas comprises an inert gas.

27. The method according to claim 26, wherein the inert gas comprises at least one of Ar, He, Kr, Xe, and N_2.

28. The method according to claim 25, wherein the purge gas is continuously flowed in the process chamber.

29. The method according to claim 25, wherein the purge gas is flowed in the process chamber prior to at least one of said exposing of said substrate and said exposing of said metal layer.

30. The method according to claim 29, wherein the purge gas is flowed for less than about 120 sec prior to at least one of said exposing of said substrate and said exposing of said metal layer.

31. The method according to claim 25, wherein a flow rate of the purge gas is between about 100 sccm and 1000 sccm.

32. The method according to claim 1, wherein the substrate temperature is between about 200° C and about 600° C.

33. The method according to claim 1, wherein a process chamber pressure is less than about 5 Torr.

34. The method according to claim 1, wherein the thickness of the metal layer deposited in one deposition cycle is between about 5 A and about 60 A.

35. The method according to claim 34, wherein the thickness of the metal layer deposited in one deposition cycle is between about 15 A and about 30 A.

36. The method according to claim 1, wherein the substrate comprises at least one of a semiconductor substrate, a LCD substrate, and a glass substrate.

37. The method according to claim 36, wherein the semiconductor substrate comprises at least one of Si, SiO_2, Ta, TaN, Ti, TiN, and high-k.

38. A method of depositing a W layer on a substrate, the method comprising:

a) providing a substrate in a process chamber;

b) exposing the substrate to a $W(CO)_6$ precursor gas;

c) forming a W layer on the substrate from thermal decomposition of the $W(CO)_6$ precursor gas;

d) exposing the W layer to a reducing gas; and

e) repeating said exposing of said substrate, said forming and said exposing of said W layer until a W layer with a desired thickness is formed.

39. The method according to claim 38, wherein a flow rate of the $W(CO)_6$ precursor is less than about 4 sccm.

40. The method according to claim 38, wherein the $W(CO)_6$ precursor gas further comprises at least one of a dilution gas and a carrier gas.

41. The method according to claim 40, wherein the at least one of a dilution gas and a carrier gas comprises an inert gas.

42. The method according to claim 41, wherein the inert gas comprises at least one of Ar, He, Kr, Xe, and N_2.

43. The method according to claim 41, wherein the precursor gas includes the carrier gas having a flow rate between about 50 sccm and about 500 sccm.

44. The method according to claim 43, wherein a flow rate of the carrier gas is between about 50 sccm and about 200 sccm.

45. The method according to claim 41, wherein the precursor gas includes the dilution gas having a flow rate between about 50 sccm and about 1000 sccm.

46. The method according to claim 45, wherein a flow rate of the dilution gas is between about 50 sccm and about 500 sccm.

47. The method according to claim 38, wherein the $W(CO)_6$ precursor flow is between about 1 sec and about 500 sec.

48. The method according to claim 38, wherein the reducing gas comprises at least one of a silicon-containing gas, a boron-containing gas, and a nitrogen-containing gas.

49. The method according to claim 48, wherein the reducing gas comprises at least one of SiH_4, Si_2H_6, and $SiCl_2H_2$.

50. The method according to claim 48, wherein the reducing gas comprises at least one of BH_3, B_2H_6, and B_3H_9.

51. The method according to claim 48, wherein the reducing gas comprises NH_3.

52. The method according to claim 38, wherein a flow rate of the reducing gas is less than about 500 sccm.

53. The method according to claim 38, wherein the reducing gas flow is between about 1 sec and about 120 sec.

54. The method according to claim 38, wherein the reducing gas further comprises a dilution gas.

55. The method according to claim 54, wherein the dilution gas comprises an inert gas.

56. The method according to claim 55, wherein the inert gas comprises at least one of Ar, He, Kr, Xe, and N_2.

57. The method according to claim 54, wherein a flow rate of the dilution gas is between about 50 sccm and about 2000 sccm.

58. The method according to claim 57, wherein a flow rate of the dilution gas is between about 100 sccm and about 1000 sccm.

59. The method according to claim 38, wherein the $W(CO)_6$ precursor and the reducing gas are sequentially flowed into the process chamber.

60. The method according to claim 38, further comprising flowing a purge gas in the process chamber.

61. The method according to claim 60, wherein the purge gas comprises an inert gas.

62. The method according to claim 61, wherein the inert gas comprises at least one of Ar, He, Kr, Xe, and N_2.

63. The method according to claim 60, wherein the purge gas is continuously flowed in the process chamber.

64. The method according to claim 60, wherein the purge gas is flowed in the process chamber prior to at least one said exposing of said substrate and said exposing of said W layer.

65. The method according to claim 64, wherein the purge gas is flowed for less than about 120 sec prior to at least one of said exposing of said substrate and said exposing of said W layer.

66. The method according to claim 60, wherein a flow rate of the purge gas is between about 100 sccm and about 1000 sccm.

67. The method according to claim 38, wherein the substrate temperature is between about 200° C and about 600° C.

68. The method according to claim 67, wherein the substrate temperature is about 410° C.

69. The method according to claim 38, wherein a process chamber pressure is less than about 5 Torr.

70. The method according to claim 69, wherein a process chamber pressure is about 0.2 Torr.

71. The method according to claim 38, wherein the thickness of the W layer deposited in one deposition cycle is between about 5 A and about 60 A.

72. The method according to claim 71, wherein the thickness of the W layer deposited in one deposition cycle is between about 15A and about 30A.

73. The method according to claim 38, wherein the substrate comprises at least one of a semiconductor substrate, a LCD substrate, and a glass substrate.

74. The method according to claim 73, wherein the semiconductor substrate comprises at least one of Si, SiO_2, Ta, TaN, Ti, TiN, and high-k.